




# Jeongbhin Seo, Ph.D.




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🌐 <https://jeongbhin.github.io/>





## Employment History

- 2024.10 - - - - -  **Chick Keller Fellow**, Los Alamos National Laboratory, Theoretical Division  
Advisor: Dr. Fan Guo, Dr. Hui Li
- 2023.12 - - 2024.9  **Postdoctoral Researcher**, Los Alamos National Laboratory, Theoretical Division  
Advisor: Dr. Fan Guo, Dr. Hui Li
- 2022.9 - - 2023.11  **Postdoctoral Researcher**, Department of Physics, Ulsan National Institute of Science & Technology.  
Advisor: Prof. Dongsu Ryu

## Education



- 2018.09 - - 2022.08  **Ph.D., Pusan National University** Earth Science.  
Advisor: Prof. Hyesung Kang  
Degree date: 08/26/2022  
Thesis title: *A Simulation Study of Ultra-relativistic Jets*.
- 2015.03 - - 2018.02  **M.Sc., Pusan National University** Earth Science.  
Advisor: Prof. Hyesung Kang  
Degree date: 02/23/2018  
Thesis title: *The Contribution of Stellar Winds to Cosmic Ray Production*.
- 2008.03 - - 2012.02  **B.Ed., Pusan National University** Earth Science Education.  
Degree date: 02/17/2012

## Awards and Fellowships

- 2024  **LANL SPOT Award**, Los Alamos National Laboratory
- 2024-2027  **Chick Keller Fellow**, Los Alamos National Laboratory
- 2021  **Busan Future Scientist Award**, Federation of Busan Science and Technology
- 2020-2022  **NRF Ph.D. Fellow**, The National Research Foundation of Korea

## Research Publications

### First-Author Papers

- 1** **J. Seo**, F. Guo, X. Li, B. Chen, C. Shen, and H. Li, “Energetic nonthermal electrons within the above-the-looptop regions in solar flares: Acceleration, feedback, and quasi-periodic pulsations,” *Submitted in ApJ*, 2025.
- 2** **J. Seo**, D. Ryu, and H. Kang, “Energy spectrum and mass composition of ultra-high-energy cosmic rays originating from relativistic jets of nearby radio galaxies,” *The Astrophysical Journal*, vol. 988, no. 2, p. 194, Jul. 2025.  DOI: 10.3847/1538-4357/ade678.
- 3** **J. Seo**, F. Guo, X. Li, and H. Li, “Proton acceleration in low- $\beta$  magnetic reconnection with energetic particle feedback,” *The Astrophysical Journal*, vol. 977, no. 2, p. 146, Dec. 2024.  DOI: 10.3847/1538-4357/ad8e64.






- 4 J. Seo, H. Kang, and D. Ryu, "Model spectrum of ultrahigh-energy cosmic rays accelerated in fr-i radio galaxy jets," *The Astrophysical Journal*, vol. 962, no. 1, p. 46, Feb. 2024. [DOI: 10.3847/1538-4357/ad182c](#).
- 5 J. Seo, H. Kang, and D. Ryu, "A new code for relativistic hydrodynamics and its application to fr ii radio jets," *IAU Symposium*, vol. 362, pp. 87–93, Jan. 2023. [DOI: 10.1017/S1743921322001314](#).
- 6 J. Seo and D. Ryu, "How-mhd: A high-order weno-based magnetohydrodynamic code with a high-order constrained transport algorithm for astrophysical applications," *Astrophysical Journal*, vol. 953, no. 1, 39, p. 39, Aug. 2023. [DOI: 10.3847/1538-4357/acdf4b](#).
- 7 J. Seo, D. Ryu, and H. Kang, "A simulation study of ultra-relativistic jets. iii. particle acceleration in fr-ii jets," *Astrophysical Journal*, vol. 944, no. 2, 199, p. 199, Feb. 2023. [DOI: 10.3847/1538-4357/acb3ba](#).
- 8 J. Seo, H. Kang, and D. Ryu, "A simulation study of ultra-relativistic jets. ii. structures and dynamics of fr-ii jets," *Astrophysical Journal*, vol. 920, no. 2, 144, p. 144, Oct. 2021. [DOI: 10.3847/1538-4357/ac19b4](#).
- 9 J. Seo, H. Kang, D. Ryu, S. Ha, and I. Chattopadhyay, "A simulation study of ultra-relativistic jets-i. a new code for relativistic hydrodynamics," *Astrophysical Journal*, vol. 920, no. 2, 143, p. 143, Oct. 2021. [DOI: 10.3847/1538-4357/ac19b3](#).
- 10 J. Seo, H. Kang, and D. Ryu, "The contribution of stellar winds to cosmic ray production," *Journal of Korean Astronomical Society*, vol. 51, no. 2, pp. 37–48, Apr. 2018. [DOI: 10.5303/JKAS.2018.51.2.37](#).

## Co-Authored Papers








- 1 F. Guo, O. French, Q. Zhang, X. Li, and J. Seo, "Particle injection problem in magnetic reconnection and turbulence," *Space Science Reviews*, vol. 221, no. 103, 2025. [DOI: 10.1007/s11214-025-01226-x](#).
- 2 X. Li, C. Shen, X. Xie, F. Guo, B. Chen, I. Oparin, Y. Wei, S. Yu, and J. Seo, "Energy conversion and electron acceleration and transport in 3d simulations of solar flares," *The Astrophysical Journal*, vol. 991, no. 2, p. 202, Sep. 2025. [DOI: 10.3847/1538-4357/adfcd5](#).
- 3 A. Bhattacharjee, J. Seo, D. Ryu, and H. Kang, "A simulation study of low-power relativistic jets: Flow dynamics and radio morphology of fr-i jets," *The Astrophysical Journal*, vol. 976, no. 1, p. 91, Nov. 2024. [DOI: 10.3847/1538-4357/ad83cc](#).

## Conferences











### Invited Talks, Seminars, and Colloquia

- |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2025.07 | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>"A New Computational Method for Energetic Particle Acceleration and Transport with Feedback: Applications to Magnetic Reconnection and Turbulence."</p> <p><b>Midwest Magnetic Fields Workshop 2025</b>, Madison, WI.</p> </div> </div>                                                                                                                                                                                                                                                                                                                                                                     |
| 2025.04 | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>"Efficient Acceleration and Feedback of Non-Thermal Electrons in Solar Flares."</p> <p><b>HSR Team+ Workshop 2025: Energy Release and Conversion in Solar Eruptive Events</b>, NJIT, Newark, NJ.</p> </div> </div>                                                                                                                                                                                                                                                                                                                                                                                          |
| 2024.10 | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>"A New Code for Relativistic Hydrodynamics and Its Application."</p> <p><b>Geophysical and Astrophysical Fluid Dynamics (GAFD) Seminar Series</b>, UC Santa Cruz, Santa Cruz, CA.</p> </div> </div>                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2024.04 | <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>"Acceleration of Non-Thermal Electrons in Solar Flares."</p> <p><b>CfA Solar Science Meeting</b>, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.</p> </div> </div> <div style="margin-top: 10px;"> <div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;">  </div> <div> <p>"Radio Galaxy Jets as the Origin of Ultra-High-Energy Cosmic Rays."</p> <p><b>CfA High Energy Seminar</b>, Harvard-Smithsonian Center for Astrophysics, Cambridge, MA.</p> </div> </div> </div> |




## Conferences (continued)

- 2024.03  “Radio Galaxy Jets as the Origin of Ultra-High-Energy Cosmic Rays.”  
**CfA Galaxy Cluster Group Meeting**, Harvard–Smithsonian Center for Astrophysics, Cambridge, MA.
- 2023.11  “Particle Acceleration in Astrophysical Phenomena.”  
**LANL Plasma Group Seminar**, Los Alamos National Laboratory, Los Alamos, NM.
- 2023.03  “Radio Galaxies as the Origin of Ultra-High-Energy Cosmic Rays.”  
**71st GWNR Workshop**, Daejeon, South Korea.
- 2023.01  “Acceleration of Ultra-High-Energy Cosmic Rays at Radio Galaxy Jets.”  
**The VLBI Group Seminar**, Max-Planck Institute, (Online), Germany.
- 2023.01  “A Simulation Study of Radio Galaxy Jets.”  
**2023 SKA-Korea Workshop**, Cheonan, South Korea.
- 2022.09  “Introduction to Relativistic Hydrodynamics Simulations and Their Applications.”  
**66th GWNR Workshop**, Pohang, South Korea.
- 2021.12  “FR-II Radio Jets and the Acceleration of UHECRs.”  
**Korea Young Astronomers Meeting Colloquium**, (Online), South Korea.

## International Conferences

- 2025.06  “Efficient Acceleration and Feedback of Non-Thermal Electrons in Solar Flares.”  
**SHINE Workshop**, Charleston, SC, Poster.
- 2024.12  “Acceleration and Transport of Nonthermal Electrons in the Solar Flare Region.”  
**AGU Fall Meeting 2024**, Washington, DC, Poster.
- 2024.08  “Particle Acceleration in Magnetic Reconnection with Feedback from Energetic Particles.”  
**AGU Fall Meeting 2024**, Washington, DC, Talk.
- 2024.08  “Efficient Electron Acceleration in the Solar Flare Region.”  
**SHINE Workshop**, Juneau, AK, Poster.
- 2024.07  “Acceleration of Non-Thermal Electrons in Solar Flares.”  
**HINODE-17/IRIS-15/SPHERE-3 Joint Meeting**, Bozeman, MT, Talk.
- 2023.07  “Generation of Ultra-High-Energy Cosmic Rays at Radio Galaxy Jets.”  
**ICGAC15**, Gyeongju, South Korea, Talk.
- 2023.06  “A New WENO Magnetohydrodynamic Code with a High-Order Constrained Transport Scheme.”  
**2023 ASTRONUM**, Pasadena, CA, Poster.
- 2022.09  “Particle Acceleration at Relativistic Jets of FR-II Radio Galaxies.”  
**2022 IAUGA**, Busan, South Korea, Poster.
- 2022.06  “Relativistic Hydrodynamic Simulations of Ultra-Relativistic Jets in the Intracluster Medium.”  
**2022 EAS**, Valencia, Spain, Poster.
- 2021.11  “A New Code for Relativistic Hydrodynamics and Its Application to FR-II Radio Jets.”  
**IAU Symposium 362: Computational Astrophysics**, (Online), Talk.



## Domestic Conferences

- 2023.10  “Radio Galaxies as the Origin of Ultra-High-Energy Cosmic Rays.”  
**2023 108th KAS Fall Meeting**, Jeju, South Korea, Talk.
- 2023.04  “A New Magnetohydrodynamic Code with a High-Order Constrained Transport Scheme.”  
**2023 107th KAS Spring Meeting**, Jeonju, South Korea, Talk.
- 2022.12  “Particle Acceleration in Radio Galaxy Jets.”  
**6th CHEA Workshop**, Cheonan, South Korea.




## Conferences (continued)

- 2022.04     “Acceleration of Ultra-High-Energy Cosmic Rays at Relativistic Jets.”  
**2022 105th KAS Spring Meeting**, Busan, South Korea, Talk.
- 2021.11     “FR-II Radio Jets and the Acceleration of UHECRs.”  
**5th CHEA Workshop**, Busan, South Korea.
- 2021.10     “FR-II Radio Jets and the Acceleration of UHECRs.”  
**2021 104th KAS Fall Meeting**, Jeju, South Korea, Talk.
- 2021.04     “Structures and Energetics of Flows in Ultra-Relativistic Jets.”  
**2021 103rd KAS Spring Meeting**, (Online), South Korea, Talk.
- 2020.10     “A New Code for Relativistic Hydrodynamics.”  
**2020 102nd KAS Fall Meeting**, (Online), South Korea, Poster.
-  “Morphology and Dynamical Properties of Ultra-Relativistic Jets.”  
**2020 102nd KAS Fall Meeting**, (Online), South Korea, Talk.
- 2020.01     “A Simulation Study of Ultra-Relativistic Jets.”  
**4th CHEA Workshop**, Busan, South Korea.
- 2019.01     “The Contribution of Stellar Winds to Cosmic Ray Production.”  
**3rd CHEA Workshop**, Gyeongju, South Korea.






## Collaboration

- 2019 - - - - -     **Center for High Energy Astrophysics (CHEA)**  
Ulsan National Institute of Science & Technology, South Korea
- 2022 - - - - -     **Wombat User Group**  
University of Minnesota, USA

## Skills

- Languages     English, Korean
- Coding        Fortran, Python, C++, IDL,  $\text{\LaTeX}$ , OpenMP, MPI
- Research      Particle acceleration, Relativistic Jets, Magnetic Reconnection, Collisionless Shock, Astrophysical Turbulence, Galaxy Cluster, Solar Flare, Heliosphere, Hydrodynamics (HD), Relativistic Hydrodynamics (RHD), Magneto-Hydrodynamics (MHD), Monte-Carlo simulation, Simulation code development

## High Performance Computing

- 5M CPU Times     LANL HPC, MHD, Particle acceleration Simulations
- 3M CPU Times     NERSC, MHD, Particle acceleration Simulations
- 4M CPU Times     CHEA Cluster, MHD, RHD, Monte-Carlo Simulations
- 2M CPU Times     UNIST Supercomputing Center, RHD Simulations
- 1M CPU Times     PNU Cluster, HD, RHD, Monte-Carlo Simulations

## Public Outreach

- 2023.08     “Astronomical Observation: Theory and Practice.”  
**Physics Festival for High School Students**, Ulsan, South Korea.

## Public Outreach (continued)

- 2023.07    📌    “Relativistic Hydrodynamics and Simulating Ultra-Relativistic Jets.”  
**Numerical Relativity and Gravitational Wave Summer School**, Daejeon, South Korea.
- 2023.05    📌    “Becoming an Astrophysicist: Career Pathways.”  
**Gaeun Middle School**, Yangsan, South Korea.
- 📌    “Becoming an Astrophysicist: Career Pathways.”  
**Muryong High School**, Ulsan, South Korea.
- 2023.01    📌    “Numerical Methods for Solving Partial Differential Equations.”  
**Numerical Relativity and Gravitational Wave Winter School**, Ulsan, South Korea.
- 2022.11    📌    “From Science Teacher to Astrophysicist.”  
**PNU Future Education Center**, Busan, South Korea.
- 2022.10    📌    “Inside the Work of an Astrophysicist.”  
**Gaeun Middle School**, Yangsan, South Korea.
- 2022.07    📌    “Career Mentoring: Exploring Astrophysics.”  
**PNU Future Education Center**, Busan, South Korea.
- 2021.12    📌    “How Coding Powers Astrophysics.”  
**Mulgeum High School**, Yangsan, South Korea.
- 2021.11    📌    “Inside the Work of an Astrophysicist.”  
**Muryong High School**, Ulsan, South Korea.

## Academic services

- 2024.10 - - - - -    📌    **Journal Reviewer**  
Astrophysical Journal
- 2024.02 - - - - -    📌    **Workshop Organizer**  
LANL Plasma Group Meeting
- 2023.03 - - 2024.04    📌    **Workshop Organizer**  
68th-72st Workshop on Gravitational Waves and Numerical Relativity
- 2023.05 - - 2023.11    📌    **Workshop Organizer**  
2023 Korea Numerical Astrophysics Group Workshop

## Teaching Experience

- 2024.02 - - - - -    📌    **Undergraduate & Postbac Mentor**  
Los Alamos National Laboratory (LANL), NM, United States
- Supervised three student researchers (Purdue University, UC Santa Cruz, University of Utah) through the LANL internship program on topics of magnetic reconnection, relativistic hydrodynamics, and heliospheric modeling.
  - Organized weekly intern workshops to enhance presentation and scientific communication skills.
- 2020.03 - - 2022.08    📌    **Teaching Assistant**  
Pusan National University, South Korea
- 2012.03 - - 2019.08    📌    **High/Middle School Science Teacher**  
Gyeongsangnam-do Office of Education, South Korea